

DATA SHEET

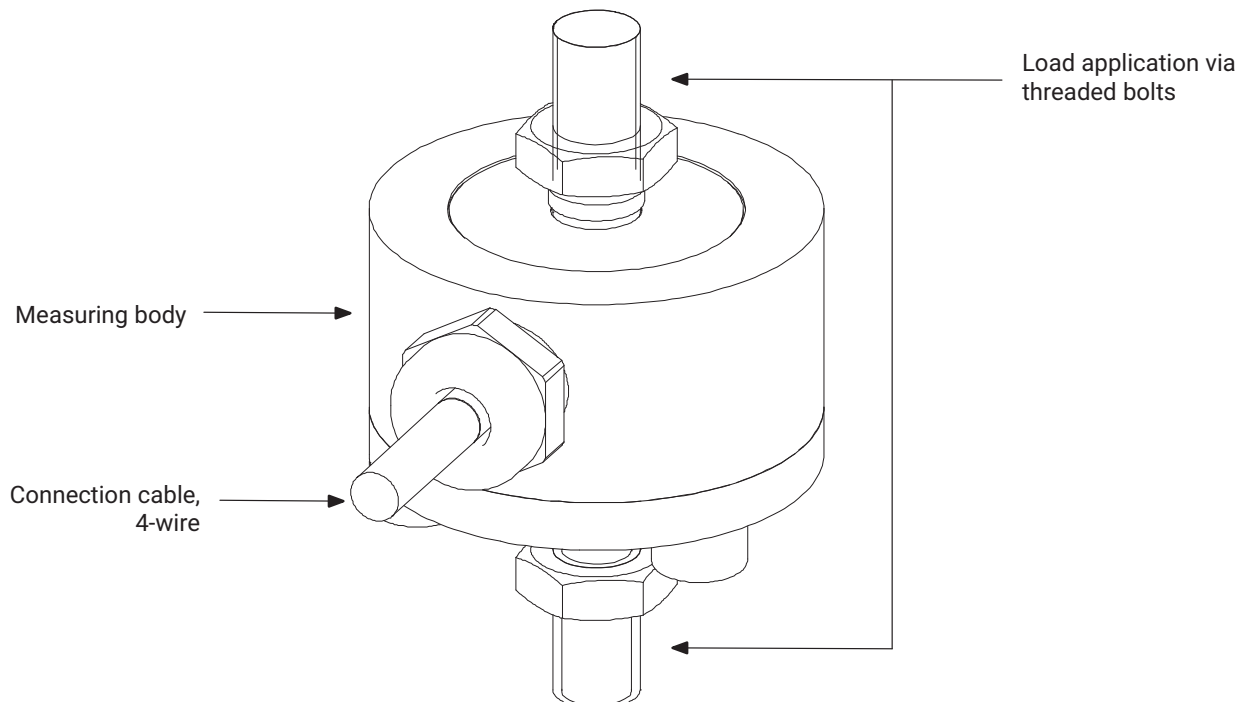
# U9C Force Transducer

## SPECIAL FEATURES

- Tensile/compressive force transducer
- Accuracy class 0.2
- Nominal (rated) forces 50 N - 50 kN
- Available on request as a measurement chain with permanently connected inline amplifier. Output signals: mA, V or IO-Link
- Non-rusting, protection class IP67
- Configurable with different cable lengths, plug assembly on request
- High rigidity, particularly suited for dynamic measurement tasks

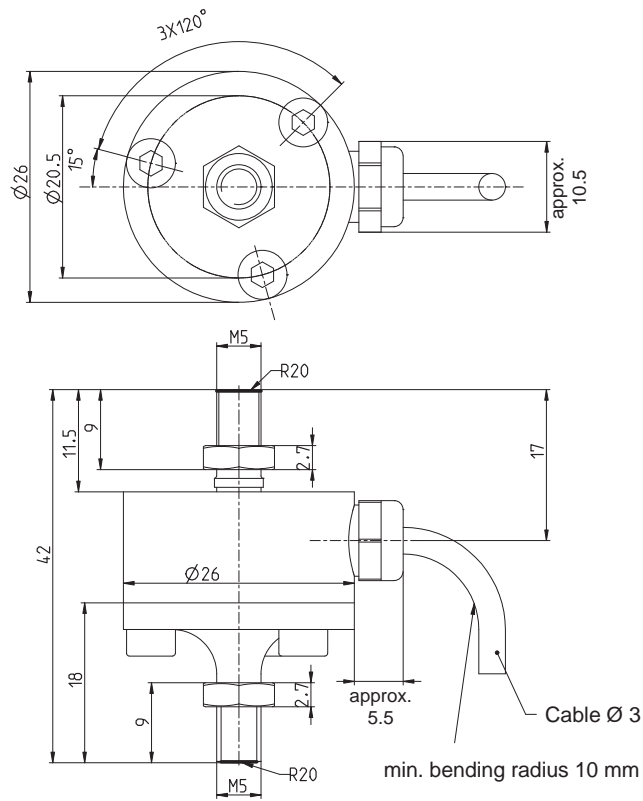


## PRINCIPLE OF THE U9C FORCE TRANSDUCER

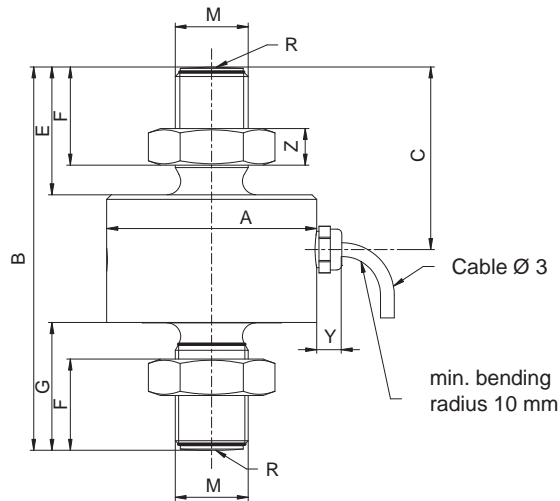


## DIMENSIONS (IN MM)

### U9C with nominal (rated) forces 50 N, 100 N and 200 N

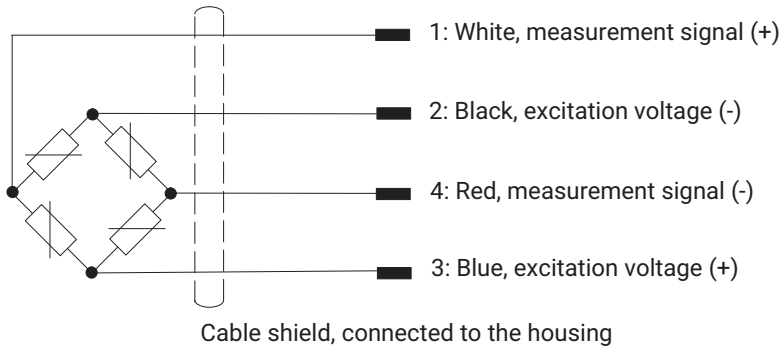


### U9C with nominal (rated) forces 0.5 kN to 50 kN



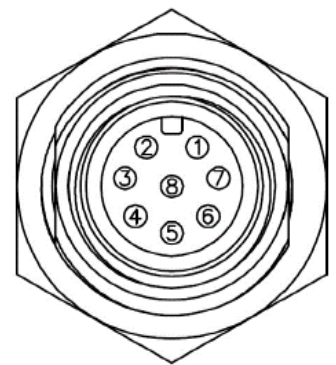
Nominal (rated) force of the U9C	A <sub>-0.1</sub>	B	C	E	F	G	M	R	Y	Z
	[mm]									
0.5 kN to 1 kN	26	44.5	20.5	13	9.5	13.5	M5	20	approx. 5.5	2.7
2 kN to 20 kN	26	60	28.5	21	16	21	M10	40	approx. 5.5	5
50 kN	46	84	40	28	21.5	28	M16 x 1.5	80	approx. 5.5	8

## WIRING DIAGRAM OF U9C WITHOUT INLINE AMPLIFIER



## PIN ASSIGNMENT OF INLINE AMPLIFIER VA1, VA2

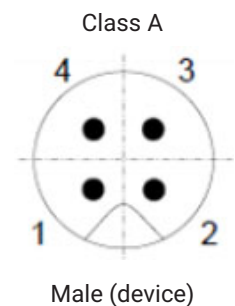
Pin	Version VA 1 (voltage output)	Version VA 2 (current output)	KAB168 connection cable wire assignment
1	Supply voltage 0 V (GND)		white
2	Not in use		brown
3	Control input zero setting		green
4	Not in use		yellow
5	Output signal 0 ... 10 V	Output signal 4 ... 20 mA	gray
6	Output signal 0 V	Not in use	pink
7	Not in use		blue
8	Voltage supply -19 ... +30 V		red



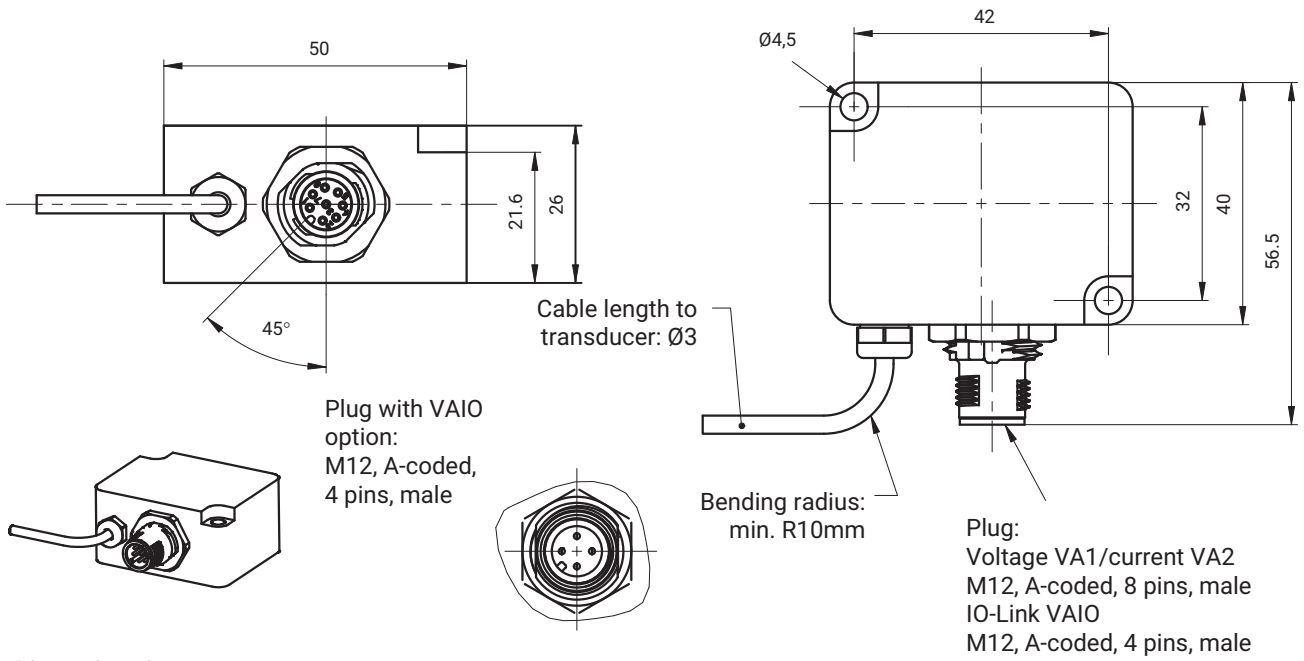
Accessories	Ordering number
KAB168-5, PUR connection cable with M12 plug and free ends, 5 m long	1-KAB168-5
KAB168-20, PUR connection cable with M12 plug and free ends, 20 m long Not suitable for use with the IO-Link interface	1-KAB168-20

## PIN ASSIGNMENT OF VAIO INLINE AMPLIFIER

PIN	U9/C9 plug assignment
1	Supply voltage +
2	Digital output (DI/DO pin function)
3	Supply voltage -, reference potential
4	IO-Link data (C/Q), automatic switch to digital output (SIO mode)



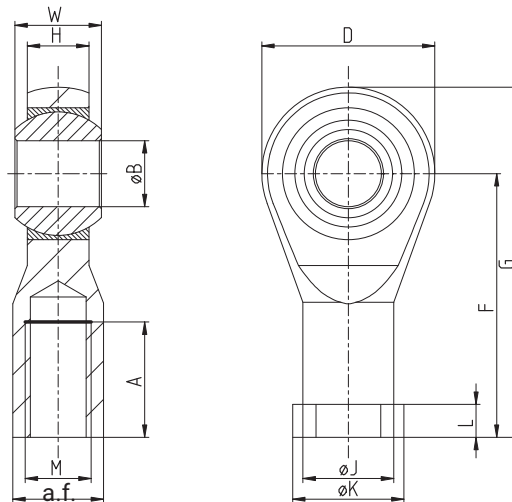
## DIMENSIONS OF INLINE AMPLIFIER VA1, VA2, VAIO



Dimensions in mm

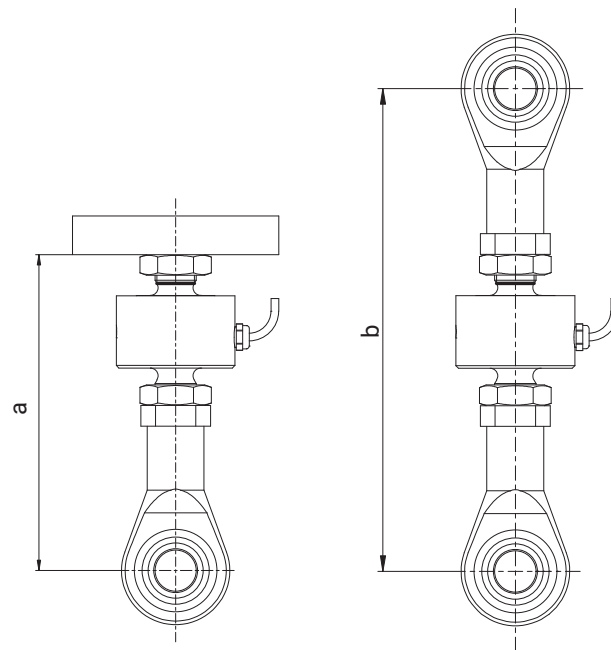
## MOUNTING ACCESSORIES (DIMENSIONS IN MM)

**Knuckle eyes** (to be ordered separately)



Nominal (rated) forces	Ordering number	A	B <sup>H7</sup>	D	F	G	H	J	K	L	M	a.f.	W
		[mm]											
50 N to 1 kN	1-Z8/100kg/ZGW	10	5	18	27	36	6	9	11	4	M5	9	8
2 kN to 20 kN	1-U9/20KN/ZGWR	20	10	28	43	57	10.5	15	19	6.5	M10	17	14
50 kN	1-U9a/50kN/ZGW	28	16	42	64	85	15	22	27	8	M16 x 1.5	22	21

## U9C with one or two knuckle eyes



Nominal (rated) force	$a_{\min}$	$a_{\max}$	$b_{\min}$	$b_{\max}$
	[mm]			
50 - 20 N	55	59	82	86
0.5 - 1 kN	56	61	83	88
2 - 20 kN	79	82	122	125
50 kN	116	116	180	180

Mounting dimensions of the U9C when using knuckle eyes

**SPECIFICATIONS U9C**

Nominal (rated) force	F <sub>nom</sub>	N	50	100	200								
						kN				0.5	1	2	5
<b>Accuracy</b>													
Accuracy class			0.2										
Relative reproducibility and repeatability errors without rotation	b <sub>rg</sub>	%	< 0.2										
Relative reversibility error	v <sub>0.5</sub>	%	< 0.2										
Non-linearity	d <sub>lin</sub>	%	< 0.2										
Relative creep (30 min)	d <sub>cr,F</sub>	%	< 0.2				< 0.1						
Effect of the bending moment at 10% F <sub>nom</sub> * 10 mm (typical)	d <sub>Mb</sub>	%	0.055	0.045	2.35					2.45	0.5		
<b>Effect of temperature on sensitivity</b>													
in the nominal (rated) temperature range	TK <sub>C</sub>	% / 10 K	0.2										
in the operating temperature range	TK <sub>C</sub>	% / 10 K	< 0.5										
<b>Effect of temperature on the zero signal</b>													
in the nominal (rated) temperature range	TK <sub>0</sub>	% / 10 K	< 0.2										
in the operating temperature range	TK <sub>0</sub>	% / 10 K	< 0.50										
<b>Electrical characteristics</b>													
Nominal (rated) sensitivity	C <sub>nom</sub>	mV/V	1										
Relative zero signal error	d <sub>s,0</sub>	mV/V	+/- 0.2										
Sensitivity error	d <sub>c</sub>	%	< +/-1 tensile , < +/-2 compressive										
Tensile/compressive sensitivity variation	d <sub>zd</sub>	%	< 2										
Input resistance	R <sub>i</sub>	Ω	250 - 400				300 - 450						
Output resistance	R <sub>o</sub>	Ω	200 - 400				145 - 450						
Insulation resistance	R <sub>is</sub>	Ω	> 1*10 <sup>9</sup>										
Operating range of the excitation voltage	B <sub>u,gt</sub>	V	0.5 - 12										
Reference excitation voltage	U <sub>ref</sub>	V	5										
Connection			4-wire circuit										
<b>Temperature</b>													
Reference temperature	t <sub>ref</sub>	°C	23										
Nominal (rated) temperature range	B <sub>t,nom</sub>	°C	-10 to +70										
Operating temperature range	B <sub>t,g</sub>	°C	-30 to +85										
Storage temperature range	B <sub>t,S</sub>	°C	-30 to +85										
<b>Characteristic mechanical quantities</b>													
Max. operating force	F <sub>G</sub>	% of F <sub>nom</sub>	200				150						
Limit force	F <sub>L</sub>		> 200				> 150						
Breaking force	F <sub>B</sub>		> 400										
Limit torque		Nm	1.7	3.4	2.5	3.7	4.5	28	23	11	11	35	
Limit bending moment when loading with nominal (rated) force		Nm	0.17	0.7	1.5	3.7	3.8	10.2	14.4	8.2	8.6	28.5	
Static lateral limit force when loading with nominal (rated) force <sup>2)</sup>	F <sub>q</sub>	% of F <sub>nom</sub>	100				50	100	50	18	6	8	
Nominal (rated) displacement		mm	0.008				0.018			0.03	0.05	0.09	0.14
Fundamental resonance frequency		kHz	6.5	9.1	12.6	15.3	15.9	13.2	14.5	14.6	14.6	7.2	
Relative oscillation width		% of F <sub>nom</sub>	70				80					70	

Nominal (rated) force	F <sub>nom</sub>	N	50	100	200							
		kN				0.5	1	2	5	10	20	50
<b>Maximum impact load to ICE 60068-2-6</b>												
Number												1,000
Duration			ms									3
Acceleration			m/s <sup>2</sup>									1,000
<b>Vibrational stress to IEC 60068-2-27</b>												
Frequency range			Hz									5 ... 65
Duration			min									30
Acceleration			m/s <sup>2</sup>									150
<b>General information</b>												
Degree of protection per EN 60529 <sup>1)</sup>												IP67
Spring element material												Steel
Potting material												Silicone
Cables												Four-wire circuit, PUR insulation
Cable length			m									1.5, 3, 7, 12
Weight			g			75					100	400

1) 1 m water column; 0.5 h

2) Pure lateral force without bending moment

### Inline amplifier VA1, VA2

Module type		VA1	VA2
<b>Accuracy</b>			
Accuracy class	%	0.15	
Relative linearity error	%	0.01	
Effect of temperature on amplification	%	0.10	
Effect of temperature on zero point	%	0.15	
<b>Rated electrical output</b>			
Output signal		0... 10 V	4 ... 20 mA
Nominal (rated) output		10 V	16 mA
Rated output tolerance		± 0.1 V	± 0.16 mA
Zero signal		5 V	12 mA
Range of output signal		-0.3... 11 V	3 ... 21 mA
Cut-off frequency (-3 dB)	kHz	2	
Supply voltage	V	19 ... 30	
Nominal (rated) voltage	V	24	
Maximum current consumption	mA	15	30
<b>Temperature</b>			
Nominal (rated) temperature range	°C	-10...+50	
Operating temperature range	°C	-20...+60	
Storage temperature range	°C	-25...+85	
Reference temperature	°C	23	
<b>Maximum impact load to ICE 60068-2-6</b>			
Number		1,000	
Duration	ms	3	
Acceleration	m/s <sup>2</sup>	1,000	
<b>Vibrational stress to IEC 60068-2-27</b>			
Frequency range	Hz	5 ... 65	
Duration	min	30	
Acceleration	m/s <sup>2</sup>	150	

Module type		VA1	VA2
<b>General information</b>			
Housing material		Aluminum	
Weight without cable	g	125	
Maximum cable length for supply voltage/output signal	m	30	
Degree of protection per EN 60529		IP67	

#### VAIO inline amplifier

Module type	VAIO	
<b>Accuracy</b>		
Accuracy class		0.01
Effect of temperature on amplification	%/10K	0.01
Effect of temperature on zero point	%/10K	0.01
<b>Rated electrical output</b>		
Output signal; interface	COM3, to IO-Link standard, class A	
Min. cycle (max. output rate)	ms	0.9
Sample rate (internal)	S/s	40000
Cut-off frequency (-3 dB)	kHz	4
Reference supply voltage	V	24
Supply voltage range	V	19 - 30
Max. power consumption	mW	3200
Noise	ppm of nominal force	With Bessel filter 1 Hz: 25 With Bessel filter 10 Hz: 63 With Bessel filter 100 Hz: 195 With Bessel filter 200 Hz: 275 Without filter: 3020
<b>Filter</b>		
Low-pass filter	Freely adjustable cut-off frequency, Bessel or Butterworth characteristic, 6th order	
<b>Device functions</b>		
Limit value switches	2 limit value switches. Invertible, freely adjustable hysteresis. Output via process data or digital output	
Digital IO	According to IO-Link Smart Sensor Profile, 1 permanently available digital output, 1 output can be set to data output, then no measurement possible	
Lag indicator function	Yes	
Peak value memory	Yes	
Peak-to-peak memory	Yes	
Warning functions	Warning on exceeding nominal (rated) force/maximum operating force; nominal (rated) temperature/maximum operating force	
<b>Temperature</b>		
Nominal temperature range	°C	-10 ... +50
Operating temperature range	°C	-10 ... +60
Storage temperature range	°C	-25... +85
Reference temperature	°C	23
<b>Maximum impact load to IEC 60068-2-6</b>		
Number	1000	
Duration	ms	3



Module type		VAIO
Acceleration	m/s <sup>2</sup>	1000
Maximum vibrational stress to IEC 60068-2-27		
Frequency range	Hz	5 ... 65
Duration	min	30
Acceleration	m/s <sup>2</sup>	150

## VERSIONS AND ORDERING NUMBERS

Code	Measuring range	Ordering number
<b>050N</b>	50 N	1-U9C/50N
<b>100N</b>	100 N	1-U9C/100N
<b>200N</b>	200 N	1-U9C/200N
<b>00K5</b>	0.5 kN	1-U9C/0.5KN
<b>01k0</b>	1 kN	1-U9C/1KN
<b>02k0</b>	2 kN	1-U9C/2kN
<b>05k0</b>	5 kN	1-U9C/5kN
<b>10k0</b>	10 kN	1-U9C/10kN
<b>20k0</b>	20 kN	1-U9C/20KN
<b>50k0</b>	50 kN	1-U9C/50KN

The ordering numbers shown in gray are preferred types, they can be delivered rapidly.

All force transducers with 1.5 m cable, open ends and without TEDS.

The order no. for the preferred types is 1-U9C...

The order no. for customer-specific designs is K-U9C-...

The ordering number example **K-U9C-05k0-03m0-VAIO-S-I001** shown below is a: U9C, nominal force 5 kN with 3 m cable, inline amplifier with IO-Link output

Cable length	Electrical connection	Transducer identification	FW version
1.5 m <b>01m5</b>	Free ends <b>Y</b>	With TEDS chip <b>T</b>	No firmware <b>N</b>
3 m <b>03m0</b>	15-pin Sub-D connector <b>F</b>	Without TEDS chip <b>S</b>	IO 1.2.0 <b>I001</b>
5 m <b>05m0</b>	Male connector MS3106PEMV <b>N</b>		
6 m <b>06m0</b>	15-pin Sub-HD connector <b>Q</b>		
7 m <b>07m0</b>	With inline amplifier 0 .. 10 V <b>VA1</b>		
12 m <b>12m0</b>	With inline amplifier 4 .. 20mA <b>VA2</b>		
	With IO-Link inline amplifier <b>VAIO</b>		

<b>K-U9C-</b>	<b>05k0-</b>	<b>03m0-</b>	<b>VAIO-</b>	<b>S-</b>	<b>I001</b>
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All cable lengths can be combined with all plugs.

TEDS can only be ordered in conjunction with a plug option. It is not possible to combine TEDS and free cable ends.

Versions with inline amplifiers (VA1, VA2 and VAIO) can only be combined with cable lengths 1.5 m and 3 m; TEDS is not available for these measurement chains.

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